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Application Number: 10/601,918
Applicants: Mikhailovskii Viktor and Myhaylovska Olga
Filing Date: 06/24/2003
Art Unit: 1724
Examiner: Thomas M. Lithgow
Title: A Method To Treat Water With Dissolved Gas

Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

Sir,

In response to the Office Action mailed 11/16/2006, please consider as follows:

1. The applicants acknowledge Office Action for this point
2. The applicants canceled the previously withdrawn claims 2-3 and 9-12.
3. The applicants are grateful for the explanation provided for this point.
4. The applicants thank the examiner for pointing this error of using (()) instead of [[]] in the previous Amendment. The examiner will kindly find a replacement Specification showing changes attached which differs from provided previously (in reply to the Office action from 06/19/2006) in only one way - all deletion marks (()) are changed to [[]]. No other changes were made.
5. The applicants tried to rework the wording of the Claims, particularly reversing letters *i* and *j*. The following starting at p.4 Listing of Claims will replace the prior version of Claims in the application
6. The Applicants respectfully disagree that a restriction "*b) the invention was patented or described in a printed publication in this or foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States*" is applicable to this application. To the best of our knowledge the claimed process never was and still is not in public use till present time. Any proposals for sale were made by us only after filing the application. In the printed publications prior to the date of application only some steps of the claimed method were described with other important steps missing and in no way from these printed steps the claimed method can be reconstructed. More about the publications follows in the next paragraph.
7. Claims 1 and 5-8 are currently rejected by the Examiner as being anticipated by Canada 2302110 (and previous Canada 2277540). The applicants are well familiar with these sources as one of the applicants is also a co-author there (V. Mikhailovskii).

As it is noted in the Office Action in Canada 2302110 water purification is achieved by a naturally occurring flotation process that includes:

- (a) a formation of gas bubbles in the water
- (b) contaminants in the water adhering to the gas bubbles
- (c) collection of froth with attached contaminants on the top of the water
- (d) removal of collected froth.

It can be seen that by themselves stages (a) and (b) are common to any Flotation or Dissolved Air Flotation water treatment method and just a presence of these stages was never a background to a rejection of a patent based on a lack of novelty.

As of (c) - a collection of froth with attached contaminants itself is also well known in treatment of water by air. So a novelty in "2302110" was a new combination of well known steps.

What was not known at the time of the "2302110" application and was only later discovered the claimed method worked only sometime or partly or to a little removal effect. A series of experiments revealed that a collection of froth claimed in the "2302110" was absolutely useless or paradoxically the collected froth could even be released downstream from the froth collector with dropping pollutants concentration downstream still taking place. It was also discovered that a volume of collected froth was far too small to contain any substantial load of removed from the water contaminants. A second trap installed downstream from the first one collected froth but no change in pollutants concentration in the water followed.

It was concluded that a pure flotation process (caused by naturally occurring in the water surfactants) and claimed in Canada 2302110 causing a froth appearance was just a side effect comparing to a major one taking place in the water and responsible for a removal effect.

So as a result of series of experiments a new stage/step was recognized as being absolutely necessary for the method to work and this was a stage of a preventing of mixing of a top water layer with underlying water body so lifted contaminants would not be taken back by vertical water currents. Another step was discovered in a series of direct experiments that floating and exposed to the air polluting particles form a film at water surface and with time a process of aggregation of these particles takes place within this film. This process was not known before as nobody studied such films.

Resulting water treatment new method includes a separation of water layers with an optional aggregation of small polluting particles due to air exposure thus being a new combination of known elements with another elements previously unknown. The claimed method coincides in steps (a) and (b) with the "2302110" only but differs in the following steps. As for these following steps they are far from being obvious because to develop the claimed method the applicants had to perform several series of experiments and to discover a not previously described in scientific literature process. Certainly no

anticipation of these crucial to the process elements was possible prior to experimenting and the applicants respectfully disagree that the claimed method can be anticipated by any person skilled in the art from a description of another process claimed in Canada “2302110” and “2277540”.

8. The Applicants respectfully disagree that the claimed method can be anticipated by cited either Smyrnnow or Grobler. In both of these cited methods air is introduced into the water from a perforated pipe at the bottom and large air bubbles rise to the top.

The method of Grobler is claimed to remove silt polluting particles and is limited to this task. The stages include an addition of chemicals to the water to cause flocculation with further addition of surfactants to make at least a part of formed aggregates hydrophobic. This promotes an attachment of these flocks or aggregates to rising air bubbles (a flotation) with further rise to the surface and a removal of floated matter.

Within the method of Smyrnnow pollutants are removed by an obliquely shield formed from air bubbles across a direction of water flow. Lifted contaminants further move along a turbulent barrier at water surface formed by rising air bubbles and later on are removed at a downstream end of this barrier.

The principal points that make the claimed method different are:

- a. In the claimed method air bubbles are not introduced into the water through a pipe perforations (as in the “Grobler” or “Smyrnnow”) but are formed within the water from dissolved air molecules. Thus in the cited methods air bubbles are large from the very beginning while in the claimed method air bubbles initially are small and continue to grow while rising to the surface.
- b. In the claimed method this difference in sizes enables air bubbles to remove small particles directly while large bubbles of the cited methods are unable to do this job (because of hydrodynamic restrictions on relative sizes of air bubbles and particles these initially large air bubbles are unable to collect small size contaminants) thus requiring either an aggregation of small silt particles prior to removal in the “Grobler” or polluting particles to be large enough from the very beginning in the “Smyrnnow” case.
- c. In the claimed method no chemicals to form aggregates are added while in the “Grobler” method they are.
- d. In the Smyrnnow case pollutants move along a turbulent barrier at the surface while in the claimed method an absence of such a surface turbulence is absolutely necessary.

Thus the claimed method has in common with the “Grobler” or “Smyrnnow” only a usage of air bubbles which is similar to any other flotation method. The physics of the claimed process is completely different from presented in the “Grobler” or “Smyrnnow”. The applicants can not see of how a person skilled in the art can anticipate the claimed invention from the cited the “Grobler” or “Smyrnnow”.